

WHAT IS CLAIMED IS:

1. A method of forming an anti-microbial wiper capable of providing liquid anti-microbial solution after multiple rinse cycles, the method comprising the steps of:

5 providing a controlled release anti-microbial formulation comprising an anti-microbial agent; and

adhering said formulation to an absorbent web containing fibers, which web retains liquid after each rinse cycle, and which formulation releases sufficient anti-microbial agent into the retained 10 liquid after each of at least five normal rinse cycles so that the retained liquid is an anti-microbial solution.

2. A method as defined in claim 1, wherein said anti-microbial formulation comprises a polymer or a polymer mixture.

3. A method as defined in claim 2, wherein said polymer 15 mixture comprises a water-swellable polymer such that the degree of swelling of said water-swellable polymer at least partially controls said release of said anti-microbial agent.

4. A method as defined in claim 2, wherein said polymer comprises a latex adhesive.

20 5. A method as defined in claim 4, wherein said latex adhesive is capable of becoming cross-linked.

6. A method as defined in claim 1, wherein said anti-microbial formulation comprises a source of anti-microbial metal ions.

7. A method as defined in claim 6, wherein said anti- 25 microbial formulation comprises a source of ions of a metal selected from the group consisting of silver, copper, zinc, mercury, antimony, lead, bismuth, cadmium, chromium and thallium.

8. A method as defined in claim 7, wherein said metal comprises silver.

30 9. A method as defined in claim 1, wherein said anti-microbial formulation comprises a source of free chlorine.

10. A method as defined in claim 1, wherein said anti-microbial formulation comprises calcium hypochlorite particles.

11. A method as defined in claim 1, wherein said anti-microbial formulation comprises a quaternary ammonium compound.

5 12. A method as defined in claim 11, wherein said quaternary ammonium compound comprises alkyl aryl benzonium chloride.

10 13. A method as defined in claim 2, wherein said polymer or polymer mixture further comprises an additive selected from the group consisting of a cross-linking agent, a catalyst, a thickener, a plasticizer, a defoamer, a colorant, a visual sensor, a pigment, composite particles, a viscosity modifier, a stabilizer, a surfactant, and combinations thereof.

15 14. A method as defined in claim 1, wherein the adhering of said anti-microbial formulation comprises spraying the formulation onto said web.

20 15. A method as defined in claim 1, wherein the adhering of said formulation onto said web comprises a process chosen from the group consisting of printing, blade applying, coating, droplet throwing, print creping, saturating, and foam applying.

16. A method as defined in claim 1, wherein said web has at least two surfaces, said formulation being applied to said at least one of said two surfaces of said web in a pre-selected pattern.

25 17. A method as defined in claim 16, wherein said formulation covers from about 10% to about 60% of said at least one surface of said web.

18. A method as defined in claim 1, wherein said formulation covers from about 20% to about 40% of said at least one surface of said web.

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19. A method as defined in claim 16, wherein said formulation covers from about 10% to about 60% of both surfaces of said web.

20. A method as defined in claim 2, further comprising the 5 step of curing said polymer mixture after said formulation has been applied to said web.

21. A method as defined in claim 16, further comprising the step of creping said at least one surface of said web to soften said web after said formulation has been applied to said web.

10 22. A method as defined in claim 1, wherein said fibers of said web comprise pulp fibers.

23. A method as defined in claim 1, wherein said fibers of said web comprise synthetic fibers.

15 24. A method of forming an anti-microbial wiper for disinfecting hard surfaces comprising the steps of:

providing a cloth-like absorbent base web containing fibers and capable of retaining liquid after a rinse cycle, said web having two outer surfaces; and

20 adhering an anti-microbial formulation to said web, said formulation comprising an anti-microbial agent and a polymer, said anti-microbial formulation containing an anti-microbial agent being capable of activation when said web is contacted with a liquid, said activation including the release of a portion of said anti-microbial agent into the retained liquid to form an anti-microbial solution, said 25 polymer being capable of controlling the rate of release of the anti-microbial agent from the anti-microbial formulation so that said anti-microbial solution is formed after at least five rinse cycles.

30 25. A method as defined in claim 24, wherein said polymer comprises an additive selected from the group consisting of a cross-linking agent, a catalyst, a thickener, a plasticizer, a defoamer, a

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colorant, a visual sensor, a pigment, composite particles, a viscosity modifier, a stabilizer, a surfactant, and combinations thereof.

26. A wiper capable of providing liquid anti-microbial solution after numerous rinse cycles comprising:

5 a controlled release anti-microbial formulation comprising an anti-microbial agent, which formulation is adhered to an absorbent, cloth-like web which retains liquid after each rinse cycle,

10 which formulation releases sufficient anti-microbial agent into the retained liquid after each of at least five normal rinse cycles so that the retained liquid is an anti-microbial solution.

27. A wiper as defined in claim 26, wherein said anti-microbial formulation comprises an antimicrobial agent and a polymer.

15 28. A wiper as defined in claim 27, wherein said polymer comprises a latex adhesive.

29. A wiper as defined in claim 28, wherein said latex adhesive is capable of becoming cross-linked.

30. A wiper as defined in claim 26, wherein said anti-microbial agent comprises a source of metal ions where the metal is selected from the group consisting of silver, copper, zinc, mercury, 20 antimony, lead, bismuth, cadmium, chromium and thallium.

31. A wiper as defined in claim 30, wherein said metal comprises silver.

32. A wiper as defined in claim 26, wherein said anti-microbial formulation comprises a source of free chlorine.

33. A wiper as defined in claim 26 wherein said anti-microbial formulation comprises a source of chlorine dioxide.

34. A wiper as defined in claim 32 wherein said anti-microbial formulation comprises calcium hypochlorite particles.

30 35. A wiper as defined in claim 26, wherein said anti-microbial formulation comprises a quaternary ammonium compound.

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36. A wiper as defined in claim 28, wherein said quaternary ammonium compound comprises alkyl aryl benzonium chloride.

37. A wiper as defined in claim 27, wherein said polymer further comprises an additive selected from the group consisting of a cross-linking agent, a catalyst, a thickener, a plasticizer, a defoamer, a colorant, a visual sensor, a pigment, composite particles, a viscosity modifier, a stabilizer, a surfactant, and combinations thereof.

38. A wiper as defined in claim 26, wherein said formulation covers from about 10% to about 60% of said at least one surface of  
10 said web.

39. A wiper as defined in claim 26, wherein said formulation covers from about 20% to about 40% of said at least one surface of said web.

40. A wiper as defined in claim 26, wherein said formulation  
15 covers from about 10% to about 60% of both surfaces of said web.

41. A wiper as defined in claim 26, wherein said fibers of said web comprise pulp fibers.

42. A wiper as defined in claim 26, wherein said fibers of said web comprise synthetic fibers.